[CLAIMS]

[Claim 1]

A method for mode switching of a multi-mode multi-band mobile communication terminal between an asynchronous mode and a synchronous mode in an idle state, the multi-mode multi-band mobile communication terminal including an asynchronous modem for communication with an asynchronous mobile communication network and a synchronous modem for communication with a synchronous mobile communication network, the method comprising the steps of:

(1) measuring a power of a received signal from the asynchronous mobile communication network;

(2) determining if the measured power of the received signal has a value lower than a preset threshold value;

(3) determining if a state in which the measured power of the received signal has a value lower than a preset threshold value is maintained during a predetermined time interval;

(4) operating the synchronous modem when the state has been maintained during a predetermined time interval; and

(5) converting a current communication mode into a synchronous mode and then entering into a synchronous mode idle state.

[Claim 2]

The method as claimed in claim 1, wherein the power measured in step (1) is a Received Signal Code Power (RSCP) which is a power of a decoded signal obtained through decoding of the received signal from the asynchronous mobile communication network by the mobile communication terminal.

[Claim 3]

The method as claimed in claim 1, wherein the power measured in step (1) includes a power of the received signal itself from the asynchronous mobile communication network and an RSCP which is a power of a decoded signal obtained through decoding of the received signal by the mobile communication terminal, and each of the power of the received signal itself and the RSCP is compared with the preset threshold value in step (2).

【Claim 4】

A method for mode switching of a multi-mode multi-band mobile communication terminal between an asynchronous mode and a synchronous mode in a traffic state, the multi-mode multi-band mobile communication terminal including an asynchronous modem

5   for communication with an asynchronous mobile communication network and a synchronous modem for communication with a synchronous mobile communication network, the method comprising the steps of:

(1) measuring a power of a received signal from the asynchronous mobile communication network;

10 (2) determining if the measured power of the received signal has a value lower than a preset threshold value;

(3) determining if a state in which the measured power of the received signal has a value lower than a preset threshold value is maintained during a predetermined time interval;

15 (4) operating the synchronous modem when the state has been maintained during a predetermined time interval;

(5) determining if a traffic state of an asynchronous mode call has ended or not;

(6) determining if a radio link with the asynchronous mobile communication network has been released or not when it is determined that the traffic state of the

20 asynchronous mode call has not ended yet; and

(7) converting a current communication mode into a synchronous mode and processing a synchronous mode call with the synchronous mobile communication network through the synchronous modem when it is determined that the radio link with the asynchronous mobile communication network has been released.

25 【Claim 5】

The method as claimed in claim 4, wherein the power measured in step (1) is an RSCP which is a power of a decoded signal obtained through decoding of the received signal from the asynchronous mobile communication network by the mobile communication terminal.

30 【Claim 6】

The method as claimed in claim 4, wherein the power measured in step (1)

includes a power of the received signal itself from the asynchronous mobile communication network and an RSCP which is a power of a decoded signal obtained through decoding of the received signal by the mobile communication terminal, and each of the power of the received signal itself and the RSCP is compared with the preset threshold value in step (2).

【Claim 7】

The method as claimed in claim 4, wherein, when it is determined in step (5) that the traffic state of the asynchronous mode call has ended, the method further comprises the steps of:

determining if the mobile communication terminal is currently located within an area of the asynchronous mobile communication network; and

deactivating the synchronous modem when the mobile communication terminal is located within the area of the asynchronous mobile communication network and entering into an asynchronous mode idle state, and deactivating the asynchronous modem when the mobile communication terminal is not located within the area of the synchronous mobile communication network and entering into a synchronous mode idle state.

【Claim 8】

The method as claimed in claim 4, wherein, when it is determined in step (6) that the radio link with the asynchronous mobile communication network has not been released yet, the method further comprises the steps of:

measuring the power of the received signal from the asynchronous mobile communication network;

determining if the power of the received signal has a value exceeding a preset threshold value; and

deactivating the synchronous modem and returning to step (5) when it is determined that the power of the received signal has a value exceeding the preset threshold value.

【Claim 9】

The method as claimed in claim 8, wherein, when it is determined that the power of the received signal has a value exceeding the preset threshold value, step (5) is re-executed in a state where the synchronous modem is operated.

【Claim 10】

The method as claimed in claim 4, wherein, after step (7), the method further comprises the steps of:

determining if the synchronous mode call with the synchronous mobile communication network through the synchronous modem has been ended or not;

determining if the mobile communication terminal is currently located within the area of the asynchronous mobile communication network when it is determined that the synchronous mode call has been ended; and

deactivating the synchronous modem when the mobile communication terminal is located within the area of the asynchronous mobile communication network and entering into an asynchronous mode idle state, and deactivating the asynchronous modem when the mobile communication terminal is not located within the area of the synchronous mobile communication network and entering into a synchronous mode idle state.

【Claim 11】

The method as claimed in claim 4, wherein step (4) comprises the steps of:

monitoring a BLock Error Rate (BLER) when it is determined in step (3) that the state in which the measured power of the received signal has a value lower than a preset threshold value is maintained during the predetermined time interval, the BLER indicating a rate of defective blocks per second received at a radio end;

comparing the BLER with a preset threshold value; and

operating the synchronous modem when it is determined that the BLER exceeds the preset threshold value.

【Claim 12】

A method for mode switching of a multi-mode multi-band mobile communication terminal between an asynchronous mode and a synchronous mode, the mobile communication terminal including an asynchronous modem for communication with an asynchronous mobile communication network and a synchronous modem for communication with a synchronous mobile communication network, the method comprising the steps of:

(1) monitoring system information from the asynchronous mobile communication network;

(2) checking preset parameter values in the monitored system information in order to determine whether to perform mode switching;

(3) operating the synchronous modem when it is determined that the preset parameter values require mode switching; and

(4) switching into the synchronous mode after operating the synchronous modem.

[Claim 13]

The method as claimed in claim 12, wherein step (3) comprises the steps of:

checking a current communication mode of the mobile communication terminal; and

operating the synchronous modem when the current communication mode of the mobile communication terminal is a preferred asynchronous mode.

[Claim 14]

The method as claimed in claim 13, wherein step (3) comprises the steps of:

when the current communication mode of the mobile communication terminal is a preferred asynchronous mode, determining if a Mobile Country Code (MCC) and a Mobile Network Code (MNC) contained in the system information correspond to a first parameter indicating a preset country code and a second parameter indicating a preset network code, respectively; and

operating the synchronous modem when the MCC and the MNC in the system information correspond to the first parameter and the second parameter, respectively.

[Claim 15]

A method for mode switching of a multi-mode multi-band mobile communication terminal between an asynchronous mode and a synchronous mode, the mobile communication terminal including an asynchronous modem for communication with an asynchronous mobile communication network and a synchronous modem for communication with a synchronous mobile communication network, the method comprising the steps of:

(1) searching overhead message information from the synchronous mobile communication network;

(2) determining if the overhead message information includes a preset mode switch parameter for mode switching;

(3) operating the asynchronous modem when it is determined that the overhead message information includes a preset mode switch parameter; and

(4) switching a communication mode of the mobile communication terminal into the asynchronous mode after operating the asynchronous modem.

[Claim 16]

The method as claimed in claim 15, wherein the mode switch parameter is set at a bit at a predetermined ordinal position from the Most Significant Bit (MSB) in the overhead message and is a parameter for notifying an overlap area between the asynchronous mobile communication network and the synchronous mobile communication network.

[Claim 17]

The method as claimed in claim 15, wherein step (3) comprises the steps of:

checking a current communication mode of the mobile communication terminal; and

operating the synchronous modem when the current communication mode of the mobile communication terminal is a preferred asynchronous mode or preferred synchronous mode.

[Claim 18]

A multi-mode multi-band mobile communication terminal comprising:

an asynchronous modem for communication with an asynchronous mobile communication network;

a synchronous modem for communication with a synchronous mobile communication network; and

a mode switch controller for managing current state of the asynchronous modem and the synchronous modem and controlling activation and deactivation of the asynchronous modem and the synchronous modem based on a communication mode corresponding to a mobile communication network to which the mobile communication terminal currently belongs, wherein:

when it is determined to perform mode switching, the mode switch controller operates a corresponding modem for connection with a target mobile communication network so that the corresponding modem acquires a network sync and performs

registration of location; and

after performing the registration of location, the mode switch controller performs communication with the target mobile communication network through the corresponding modem and deactivates another modem having been communicating with another mobile
5   communication network.

[Claim 19]

A method for mode switching of a multi-mode multi-band mobile communication terminal between an asynchronous mode and a synchronous mode, the mobile communication terminal including modems for communication with an asynchronous
10   mobile communication network and a synchronous mobile communication network, the method comprising the steps of:

(1) operating a corresponding modem for connection with a target mobile communication network which is a target of mode switching, when it is determined to perform the mode switching;

15   (2) acquiring a network sync with the target mobile communication network by the corresponding modem;

(3) performing registration of location to the target mobile communication network; and

(4) performing communication with the target mobile communication network
20   through the corresponding modem and deactivating another modem having been communicating with another mobile communication network.

[Claim 20]

The method as claimed in claim 19, wherein, before step (1), it is determined to perform the mode switching when the mobile communication terminal receives a mode
25   switch parameter from a base station of the synchronous mobile communication network while moving into an area of the asynchronous mobile communication network from an area of the synchronous mobile communication network, the base station being located within an overlap area between the asynchronous mobile communication network and the synchronous mobile communication network.

30   [Claim 21]

The method as claimed in claim 19, wherein, before step (1), when the mobile

communication terminal moves into the area of the asynchronous mobile communication network from the area of the synchronous mobile communication network, the mobile communication terminal monitors system information from the asynchronous mobile communication network and determines to perform the mode switching if a preset parameter value for the mode switching are included in the monitored system information.

[Claim 22]

The method as claimed in claim 19, wherein, before step (1), whether to perform the mode switching is determined based on a result of comparison between a signal intensity of the asynchronous mobile communication network and a preset signal intensity.

[Claim 23]

The method as claimed in claim 19, wherein it is determined to perform the mode switching when a current communication mode of the mobile communication terminal is a preferred asynchronous mode or preferred synchronous mode.

[Claim 24]

A method for mode switching of a multi-mode multi-band mobile communication terminal between an asynchronous mode and a synchronous mode, the mobile communication terminal including an asynchronous modem for communication with an asynchronous mobile communication network and a synchronous modem for communication with a synchronous mobile communication network, the method comprising the steps of:

(1) switching a current mode of the mobile communication terminal into an asynchronous mode and searching for an asynchronous signal, when the mobile communication terminal receives a system message from the synchronous mobile communication network while being located within an overlap area between the asynchronous mobile communication network and the synchronous mobile communication network, the system message indicating mode switching from the synchronous mobile communication network to the asynchronous mobile communication network;

(2) determining if an asynchronous signal is detected and if registration of location has been performed; and

(3) when no asynchronous signal is detected or when the registration of location has not been performed yet, switching a current mode of the mobile communication

terminal into a synchronous mode, waiting during a counting interval and counting a number of times for the searching, and then feedbacking to step (1).

【Claim 25】

The method as claimed in claim 24, wherein step (1) comprises the steps of:

checking a current communication mode by the mobile communication terminal; and

searching for the asynchronous signal by the mobile communication terminal when the current communication mode is one of a preferred asynchronous mode and a preferred synchronous mode.

【Claim 26】

The method as claimed in claim 24, wherein, in step (3), the counting interval increases as the number of times for the searching increases.

【Claim 27】

The method as claimed in claim 26, wherein the mobile communication receives a system parameter from the asynchronous mobile communication network for searching the asynchronous signal and the counting interval is determined based on the system parameter in step (3).

【Claim 28】

The method as claimed in claim 27, wherein the system parameter contains information of a unit interval T for searching the asynchronous signal, a modulus A for determining the time interval of asynchronous signal searching, and

a maximum threshold Nmax for the number of times for searching the asynchronous signal, and the counting interval is determined by an equation,

$$t = A^n * T,$$

where n denotes a number of times by which the mobile communication terminal has performed searching for the asynchronous signal and n has a value increasing by one each time from 1 to 'Nmax'.

【Claim 29】

The method as claimed in claim 28, wherein, when the number of times of searching the asynchronous signal exceeds the threshold value 'Nmax' the counting interval is fixed to a value $A^{Nmax} * T$ regardless of the number of times of searching thereafter.

【Claim 30】

The method as claimed in claim 27, wherein, the system parameter is one of a system parameter received by the mobile communication terminal from the asynchronous mobile communication network and a system parameter set and stored in advance in the

5   mobile communication terminal.

【Claim 31】

A method for mode switching of a multi-mode multi-band mobile communication terminal between an asynchronous mode and a synchronous mode, the mobile communication terminal including an asynchronous modem for communication with an

10   asynchronous mobile communication network and a synchronous modem for communication with a synchronous mobile communication network, the method comprising the steps of:

(1) searching for an asynchronous signal by the mobile communication terminal in the asynchronous mode and sending a request for registration of a location of the mobile

·15   communication terminal to a corresponding asynchronous communication network when an asynchronous signal is detected; and

(2) when the request for the registration of the location is rejected, switching a current communication mode of the mobile communication terminal into a synchronous mode, detecting a synchronous signal, and registering the location of the mobile

20   communication terminal in the synchronous communication network.

【Claim 32】

The method as claimed in claim 31, wherein step (1) comprises the steps of:

checking a current communication mode by the mobile communication terminal; and

25   searching for the asynchronous signal by the mobile communication terminal when the current communication mode is a preferred asynchronous.

【Claim 33】

The method as claimed in claim 31, wherein, when no asynchronous signal is detected through the searching by the mobile communication terminal in step (1), the

30   mobile communication terminal performs step (2) by switching a current communication mode of the mobile communication terminal into a synchronous mode, detecting a

synchronous signal, and registering the location of the mobile communication terminal in the synchronous communication network.

【Claim 34】

The method as claimed in claim 32, wherein, when no asynchronous signal is detected through the searching by the mobile communication terminal in step (1), the mobile communication terminal performs step (2) by switching a current communication mode of the mobile communication terminal into a synchronous mode, detecting a synchronous signal, and registering the location of the mobile communication terminal in the synchronous communication network.

【Claim 35】

The method as claimed in claim 31, wherein step (2) comprises the steps of:

when the request for the registration of the location to a corresponding asynchronous communication network is rejected, switching the mobile communication terminal into an emergency communication state in which the mobile communication terminal can process only an emergency call; and

switching the current communication mode of the mobile communication terminal into a synchronous mode after the switching into the emergency communication state.